AIRPACT Updates

NW-AIRQUEST Annual Meeting

March 31, 2010

Topics

- AIRPACT operations and logistics
- Progress with satellite products
- Wind Erosion Prediction System (WEPS) in AIRPACT
- Pollen, Asthma and AIRPACT
- PM2.5 species evaluation
- Deposition mapping

AIRPACT operations & logistics

- MCIP v 3.3
- SMOKE v2.1, but with plume rise (LAYPOINT v 2.4)
- CMAQ v4.6 with DENRATE option (was YAMO).
- For Sept 1, 2009 thru March 29, 2010 (7 months)
  - Failed to run or ran the next day for eight days.
- Average time of AIRPACT files completion 5:25 AM.
- Monthly backups for 2008, 2009, 2010 to USB drives for MCIP and CCTM files trimmed to 25 hrs.

AIRPACT
operations & logistics (cont.)

AIRNow extractions for web-plotting --

- Extraction processing was updated from algorithmic approach to simple use of MCIP grids.
- But, MCIP3.3 shows errors in GRIDCRO2D, so now using GRIDCRO2D.
- GRIDDOT2D problem is fixed in MCIP v3.5 beta.

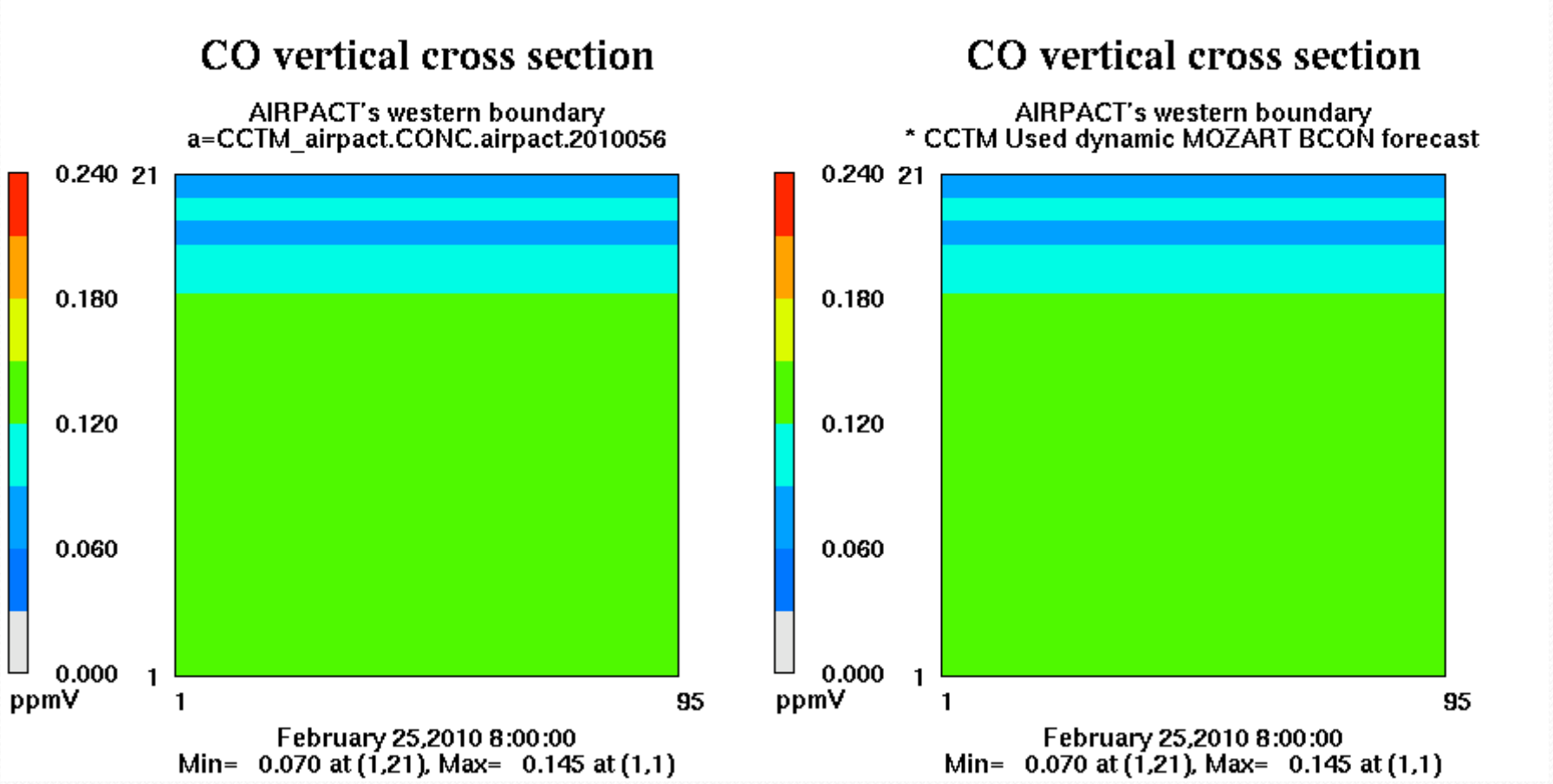
Satellite products in AIRPACT

1. MOZART global model output from NCAR as a dynamic boundary condition—daily updates
2. Land Class / Land Use development
3. Urban trends retrieved from the 0.25° Level 3 OMI (NASA) Tropospheric NO_2 product
4. Implications of using OMI NO_2 averaging kernels with the model

Chemical BC from MOZART (NCAR)

- MOZART is a global chemical transport model developed at NCAR
- Emmons (NCAR) is now providing MOZART forecast hourly chemical boundary conditions
- Dynamic BC replaces the current monthly averaged diurnal boundary conditions (also from MOZART)
- Next step (at NCAR) is to complete assimilation of MOPITT carbon monoxide (especially significant in trans-Pacific events)
- Code that automates download, conversion, and use by AIRPACT is built and going through testing

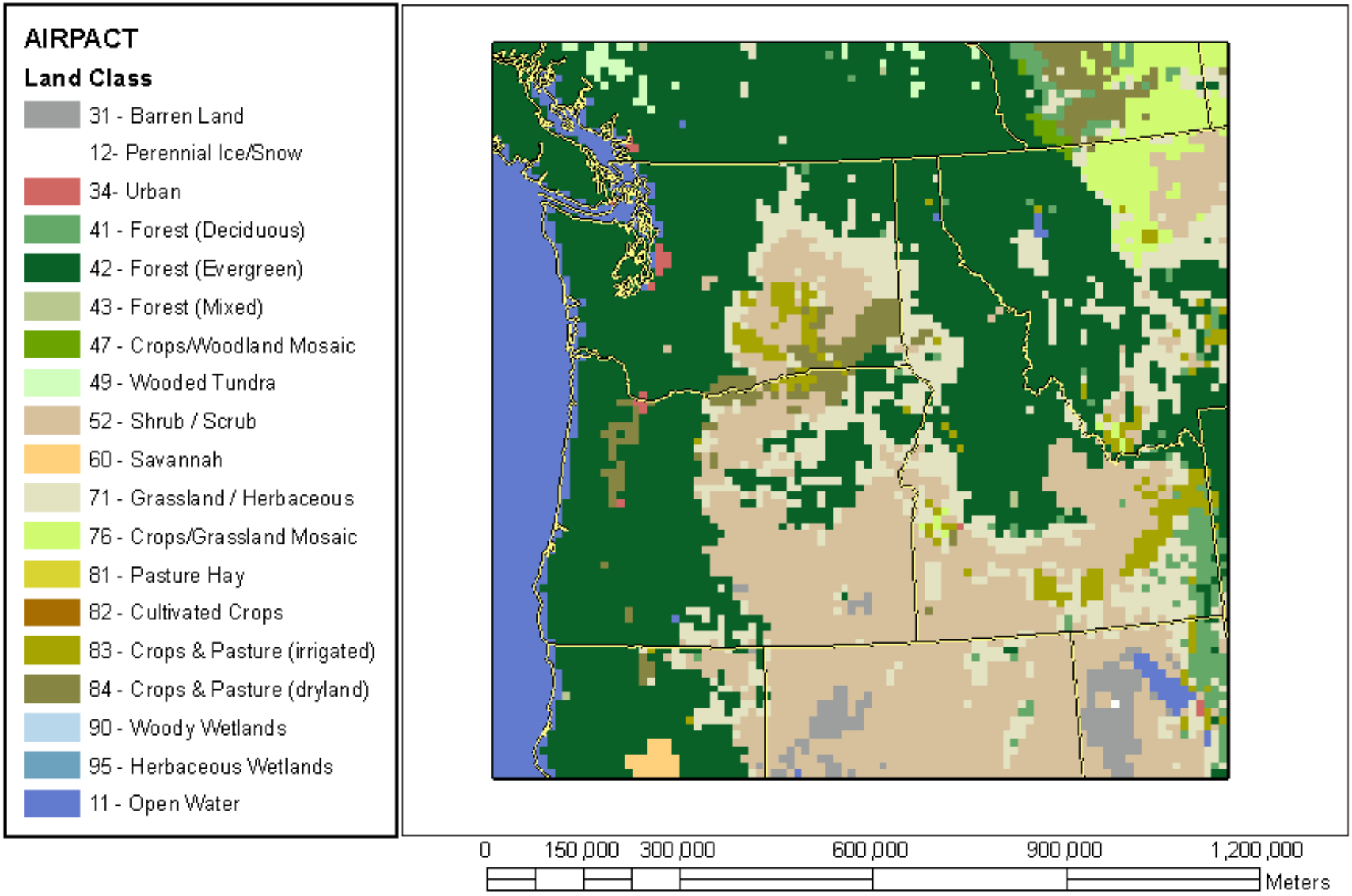
BC from MOZART (NCAR) (example)



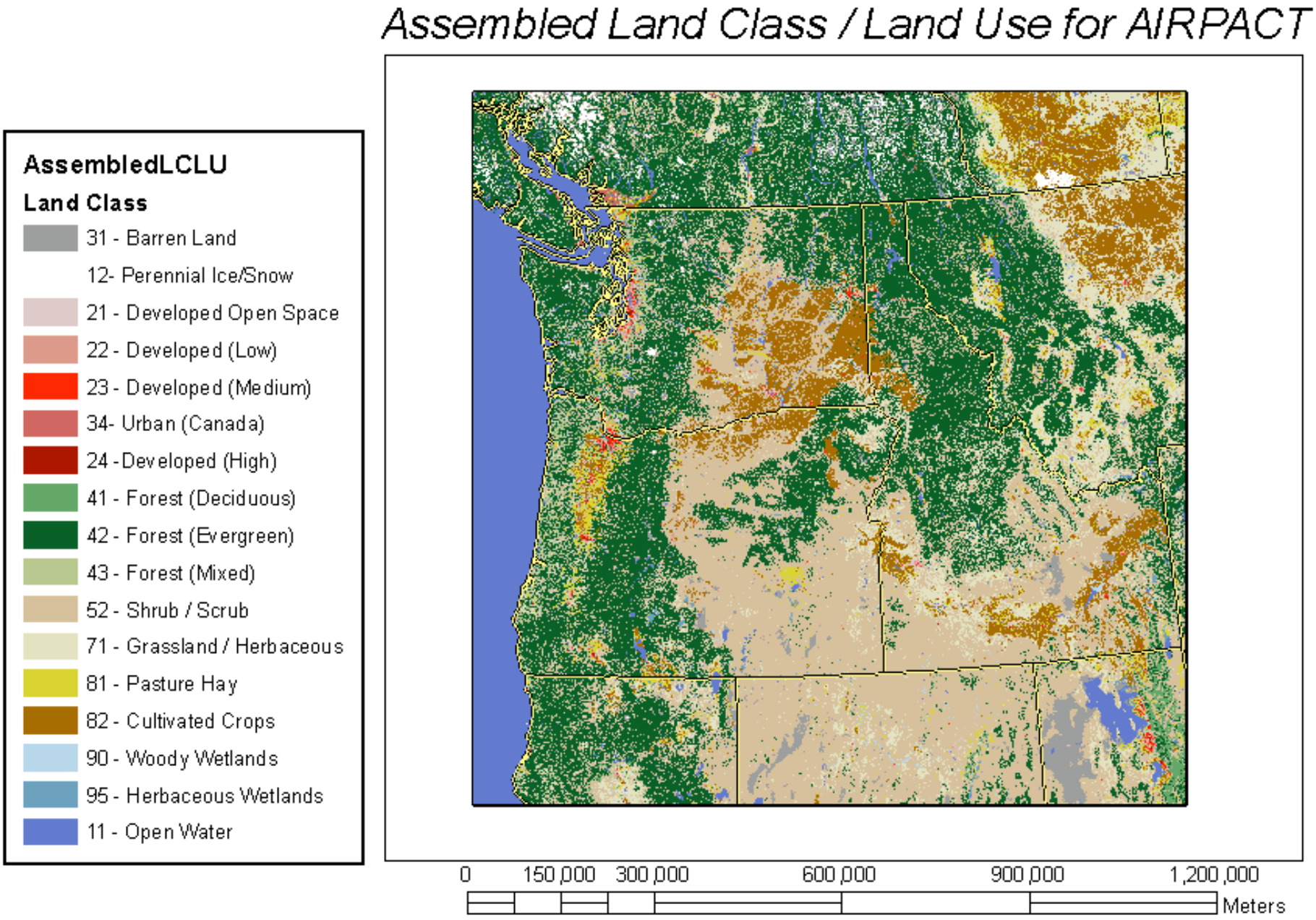
Land Class / Land Use

- New developments will allow us to incorporate more detailed and more recent land cover/land use into AIRPACT
- The new version of MCIP accepts fractional land use.
- An updated (2001) LandSat-7 derived LCLU has been assembled for use in the new MCIP
- A version of this updated LCLU map is ready to update the current LCLU used in AIRPACT

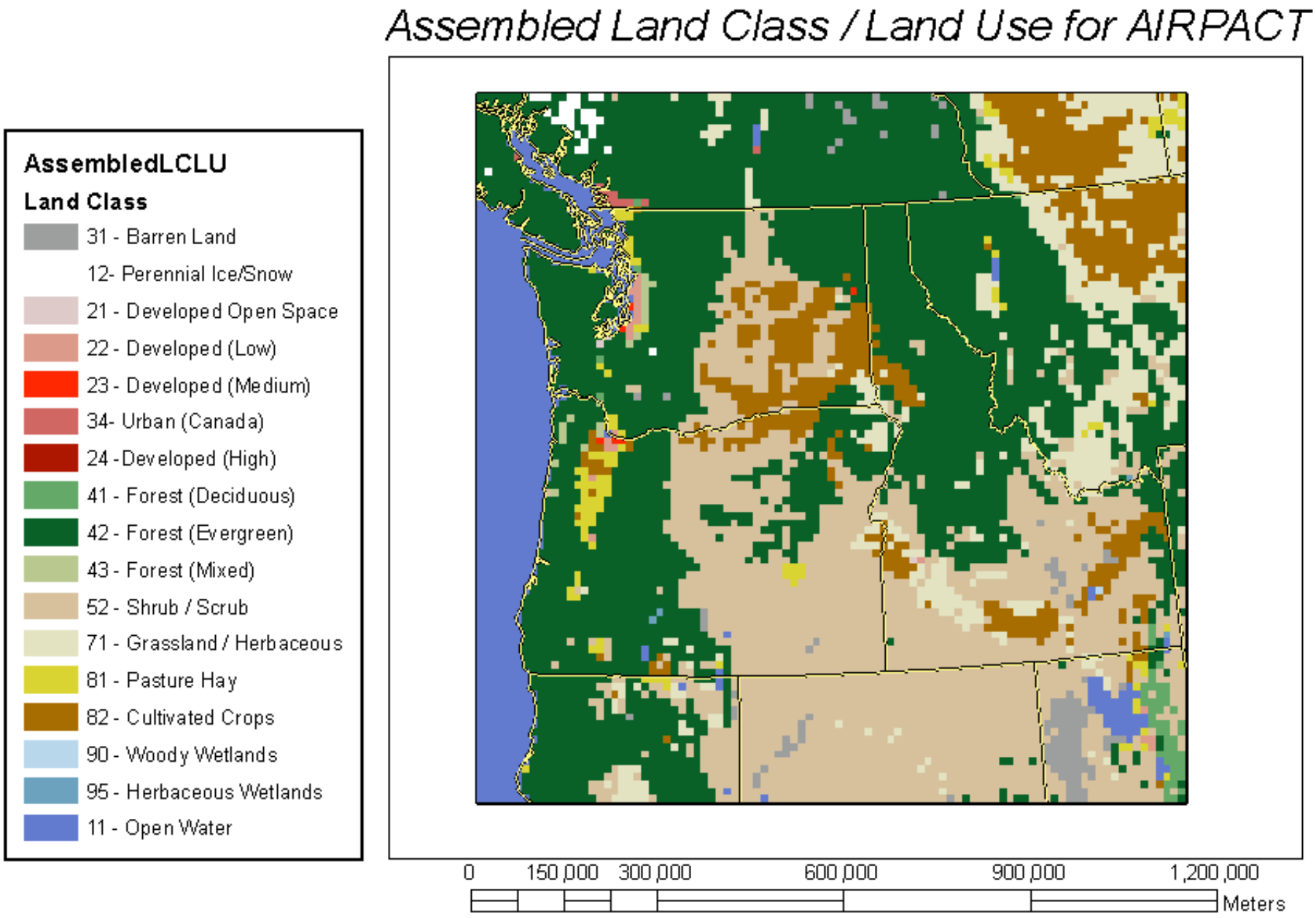
Current Land Class / Land Use for AIRPACT



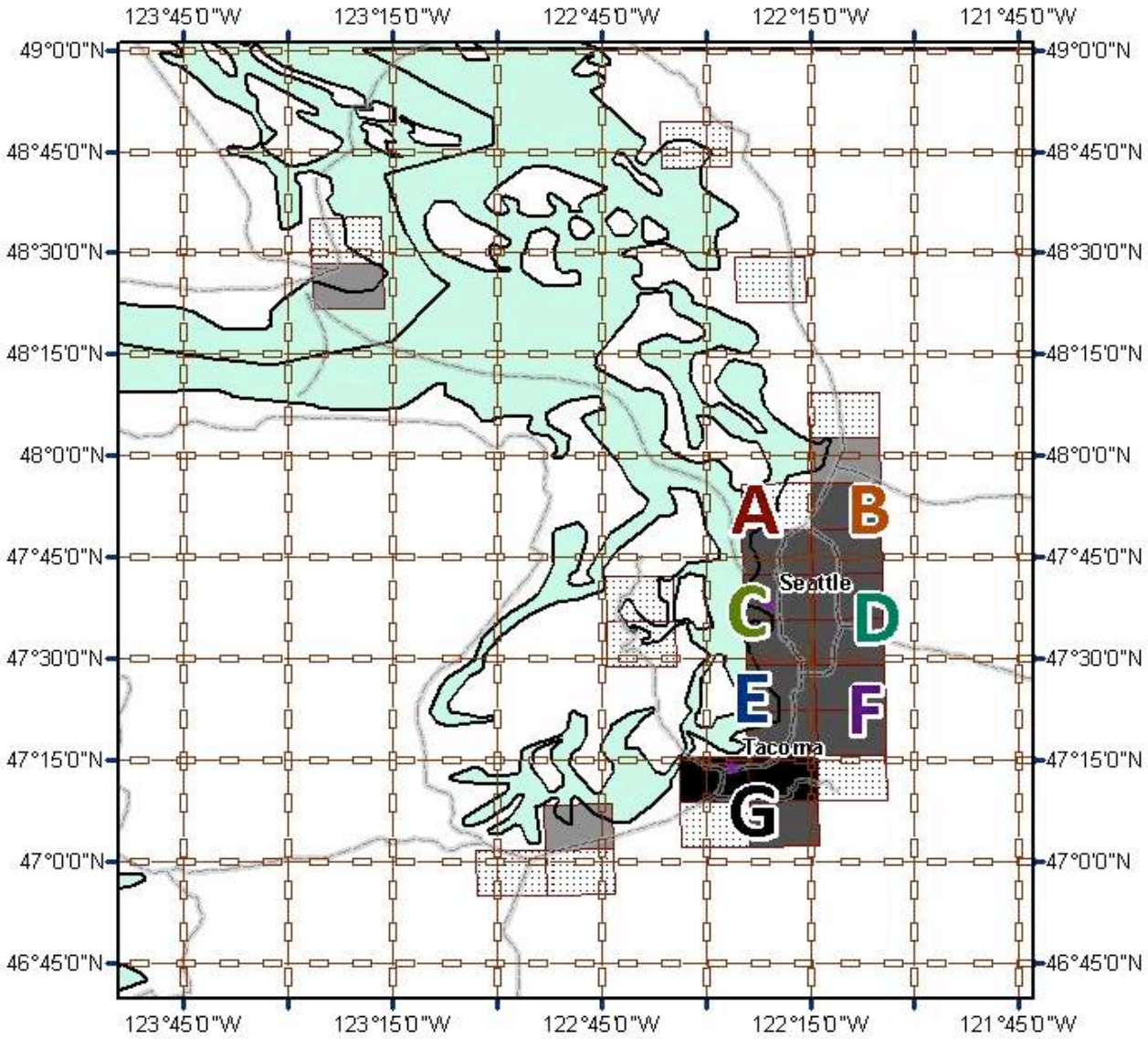
Based on 2001 Land-Sat7 derived radiances from GEOBASE (Canada) & NLCD (USA)



2001 GIS assembled Land-Sat7 derived LCLU
(most dominant type per grid cell)



Seattle / Tacoma Urban Area Fraction



The map to the left shows the fraction of urban area for AIRPACT pixels using an assembled 2001 Land Class/Land Use from LandSat derived radiances.

The 0.25 degree grid shows the pixel locations used in the Level 3 OMI NO2 grid.

Level 3 OMI pixels containing more than 40% urban area were used for the day of week analysis.

Major Highways

Boundaries

Assembled 2001 LCLU

Fraction of Urban Area

0.0 - 0.3

0.3 - 0.4

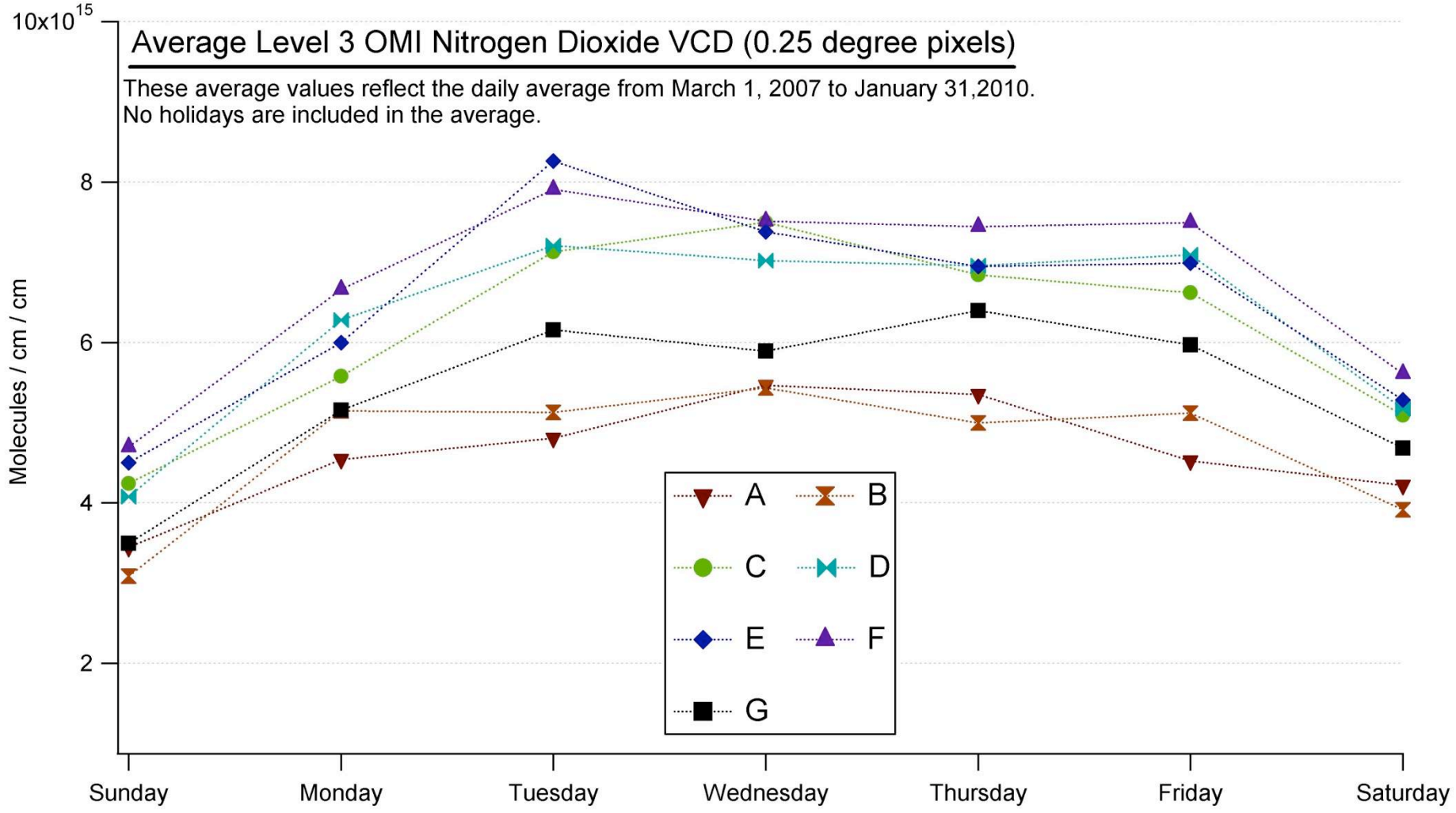
0.4 - 0.5

0.5 - 0.75

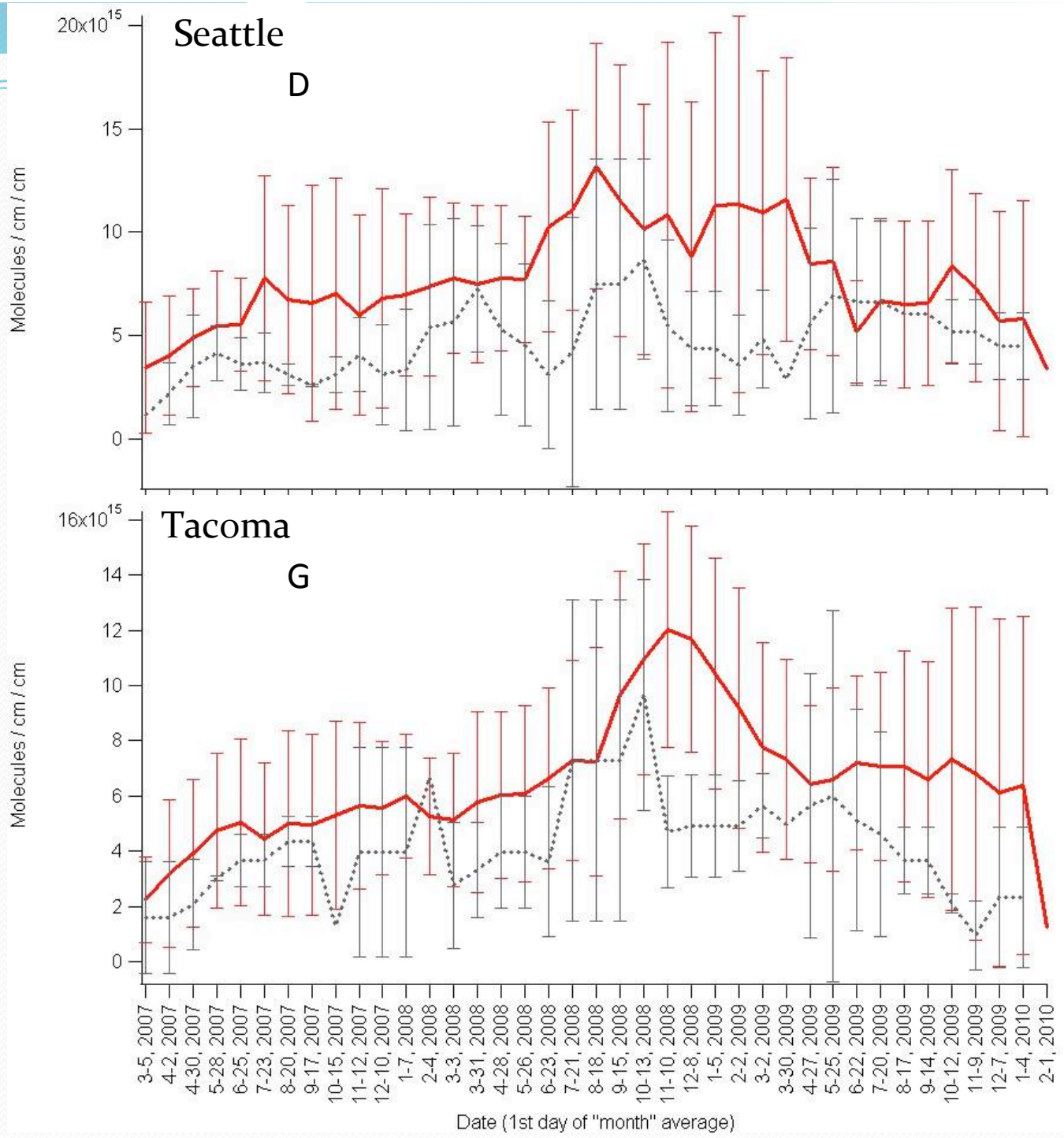
0.75- 1.00

Day of Week Average OMI NO2 Observations

Seattle/Tacoma (keyed to map on previous page)



Weekday (blue) and Weekend (red) NO2 Observations 2007 - 2010



Trend analysis and next steps

• Clear measured differences in NO2 urban column observations: Weekends are lower than weekdays

• seasonal and annual differences exist and these differences have different patterns in different urban areas

•These patterns are biased by the current NASA product which employs a fixed seasonal stratospheric signature (results in higher NO2 in summer compared to the Dutch KNMI product)

•Next steps:

- •Interpolate KNMI level 2 product to similar grid for comparison
- •Compare both to AIRPACT results

Initial analyses of NO2 from OMI were based upon the NASA algorithm and product (maps on AIRPACT web site)

We have found significant differences in the NASA and KNMI algorithms

NASA is now working with KNMI to resolve these differences.

Next Steps for our analysis of OMI NO2 and AIRPACT

- Finalize comparisons of the a priori profiles used in both products
- Incorporate comparison into journal paper (reviewed and now being revised, Thorpe et al., ACPD, 2010

WEPS and Airpact

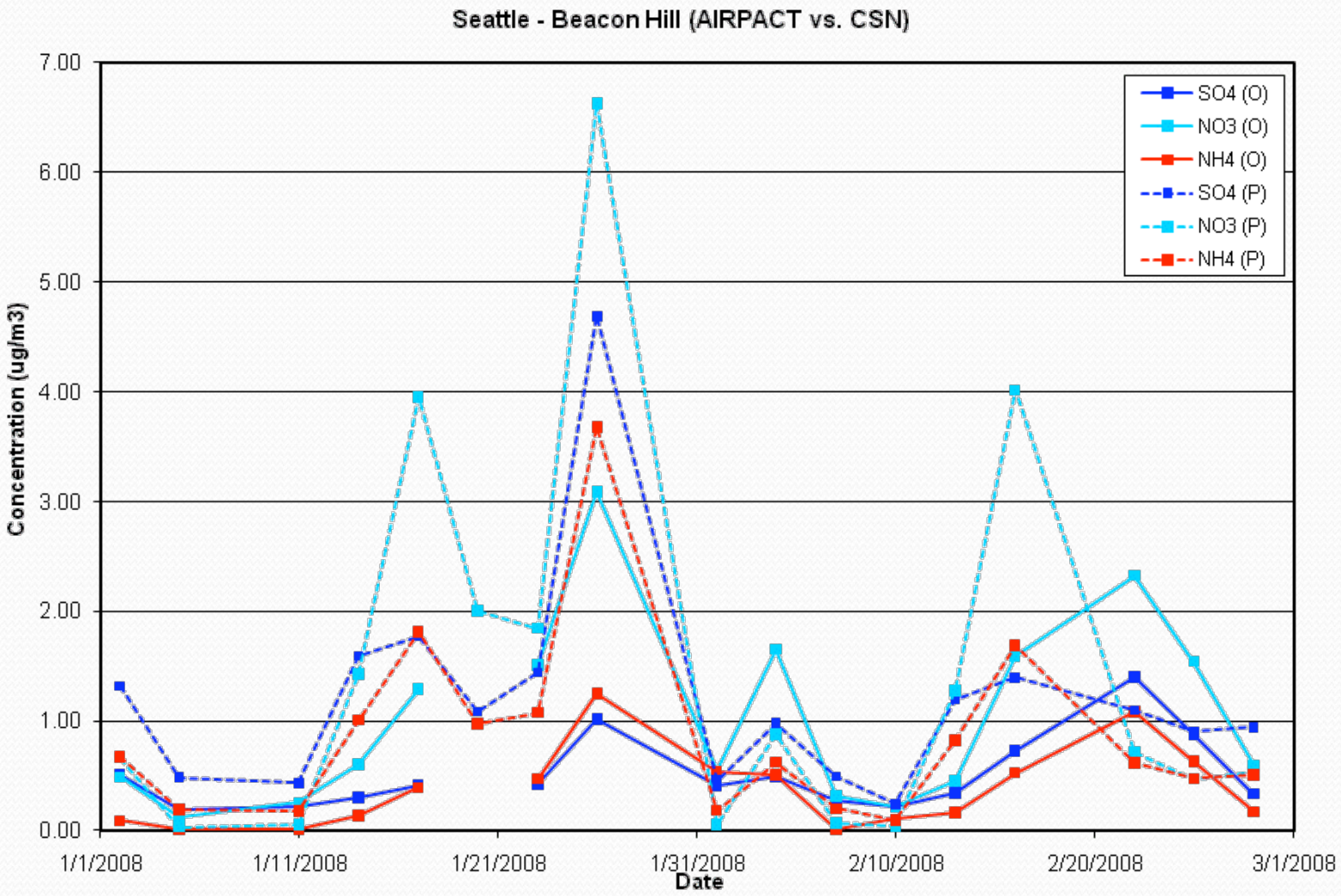
Pollen Health Impact

- New EPA STAR grant
- With Caltech, NCAR and USC
- Pollen rupture to produce allergenic PM fine
- Impact of allergenic PM on asthma and in synergism with other pollutants
- Measurements to parameterize pollen release and rupture
- Incorporation of pollen release into MEGAN and AIRPACT framework
- Current modeling and future climate projections

AIRPACT Evaluation for Speciated PM

- Initial evaluation using speciated data from Seattle (Beacon Hill), Tacoma, Spokane and Yakima
- Jan, Feb 2008
- SO_4, NO_3, NH_4, OC, EC, Soil, 'Total PM'=sum of species)
- In preparation for semi-automated evaluation process and web distribution of results
- IMPROVE sites also included (not shown here)

Speciated PM at Seattle Beacon Hill: Observed and Predicted



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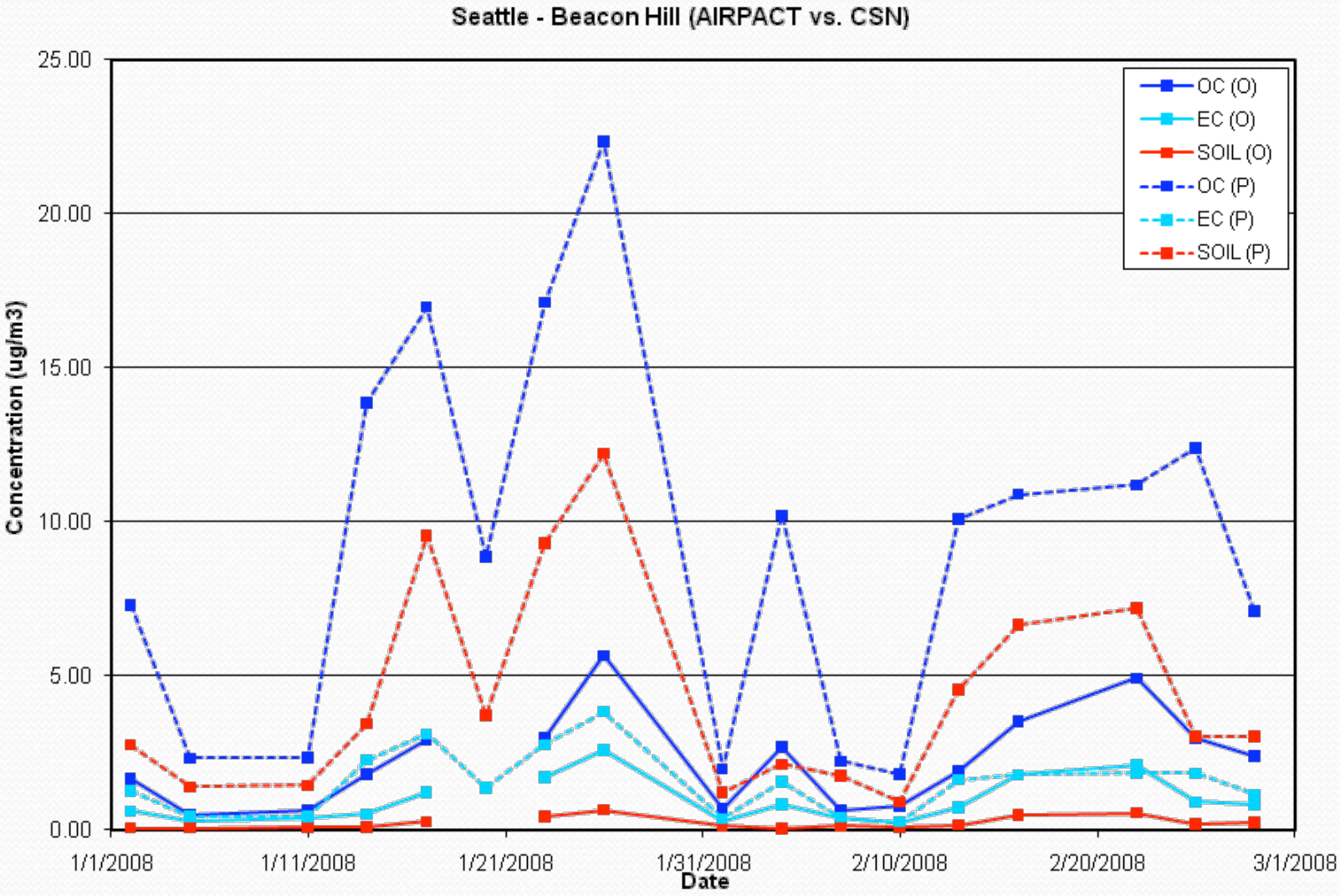

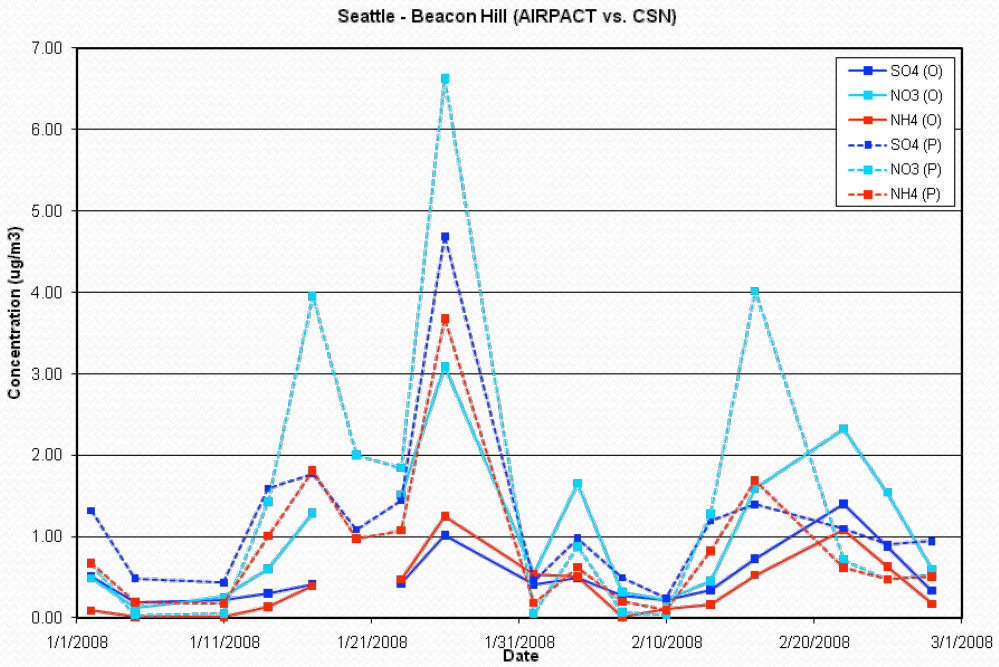

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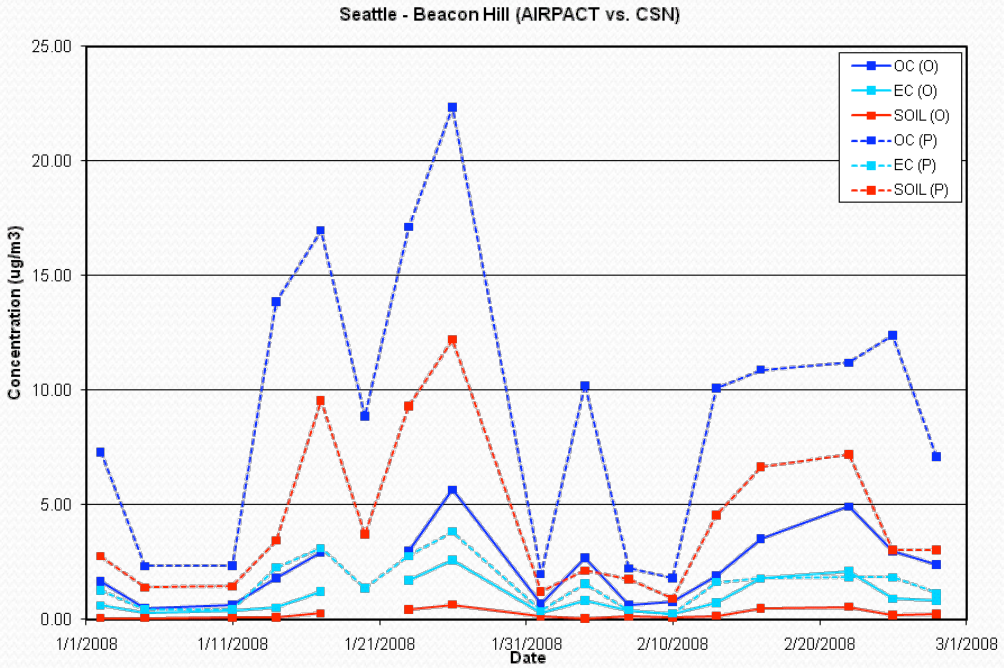
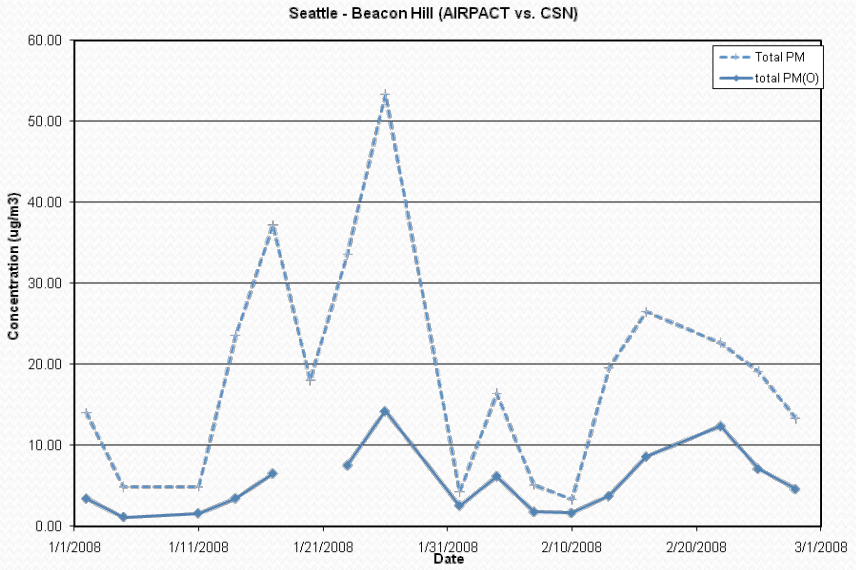
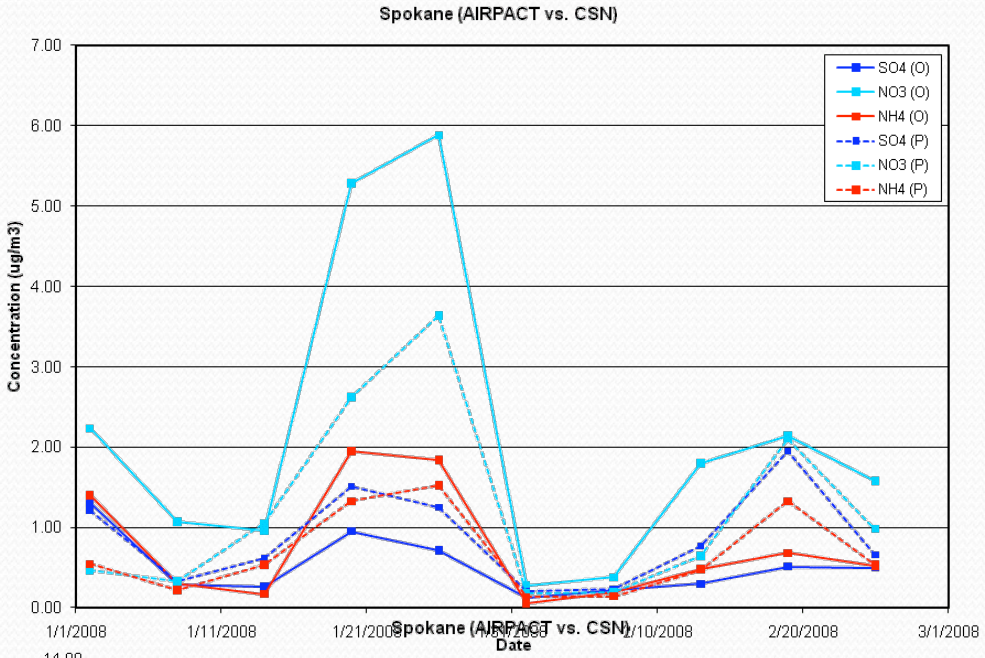
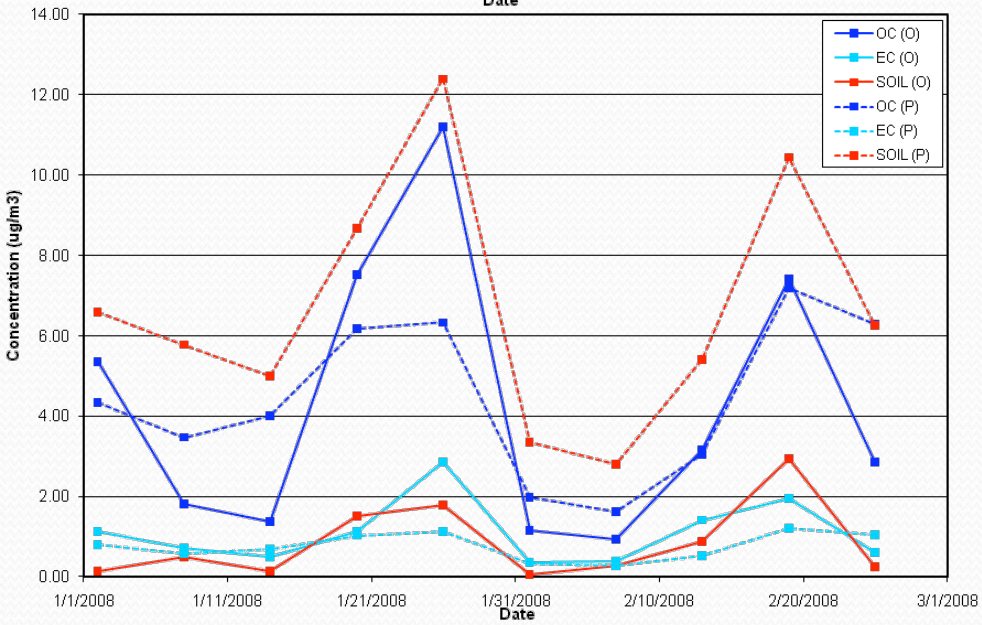
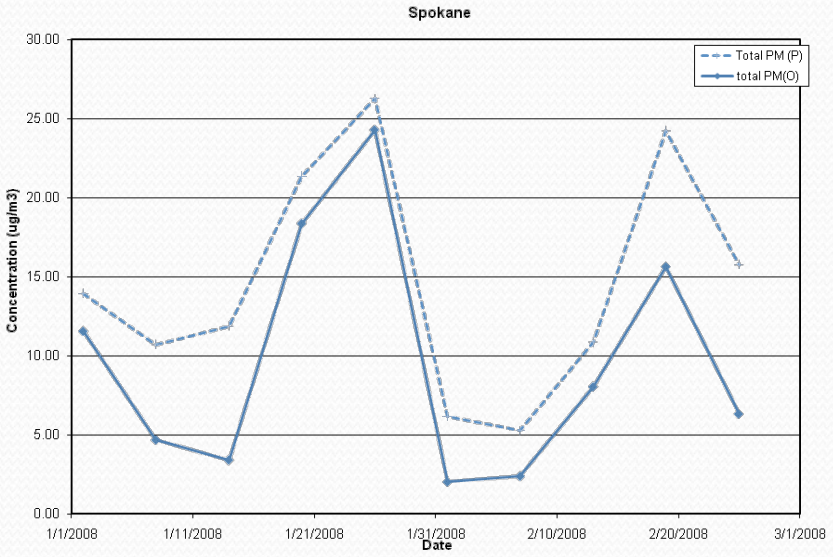




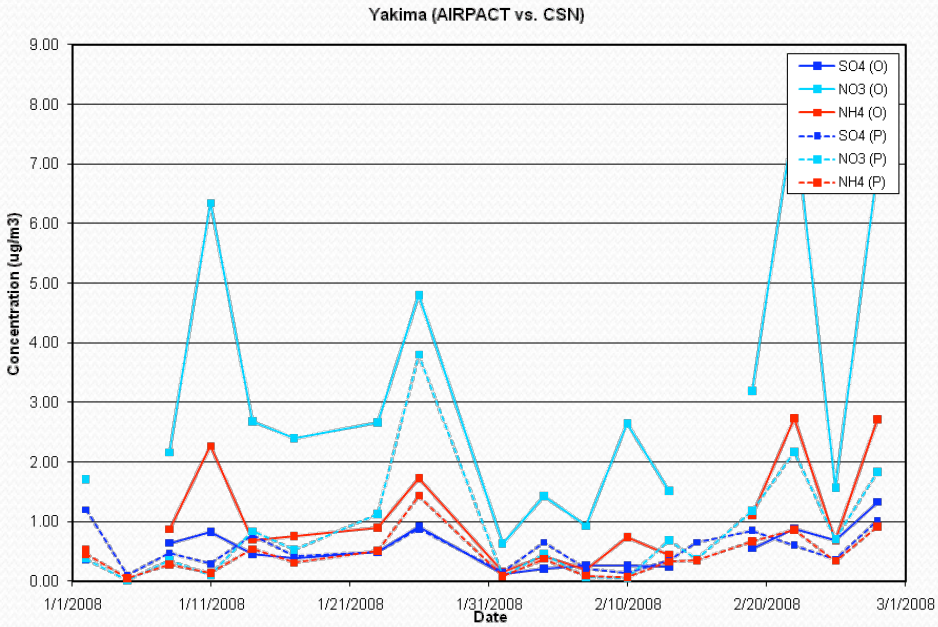
Speciated PM at Spokane

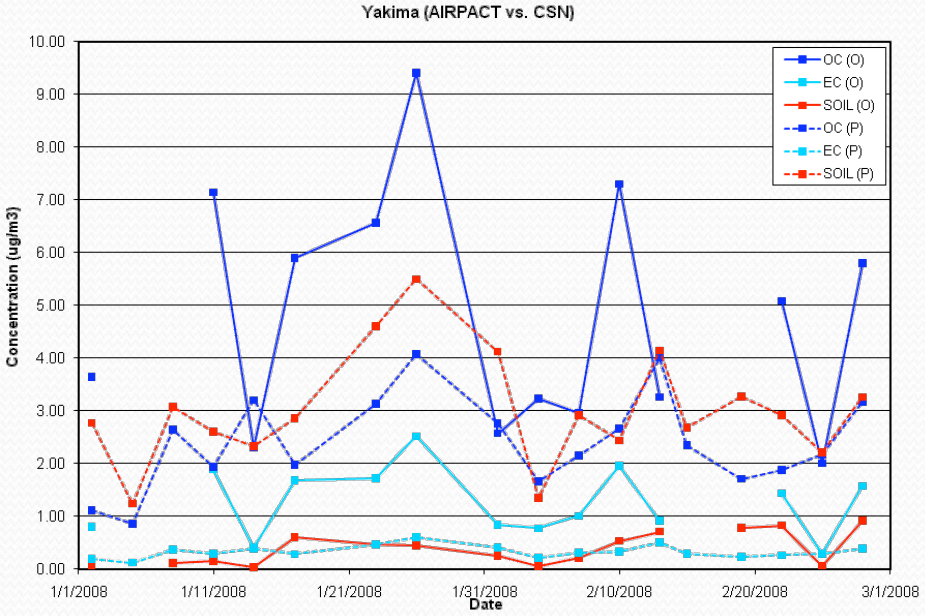


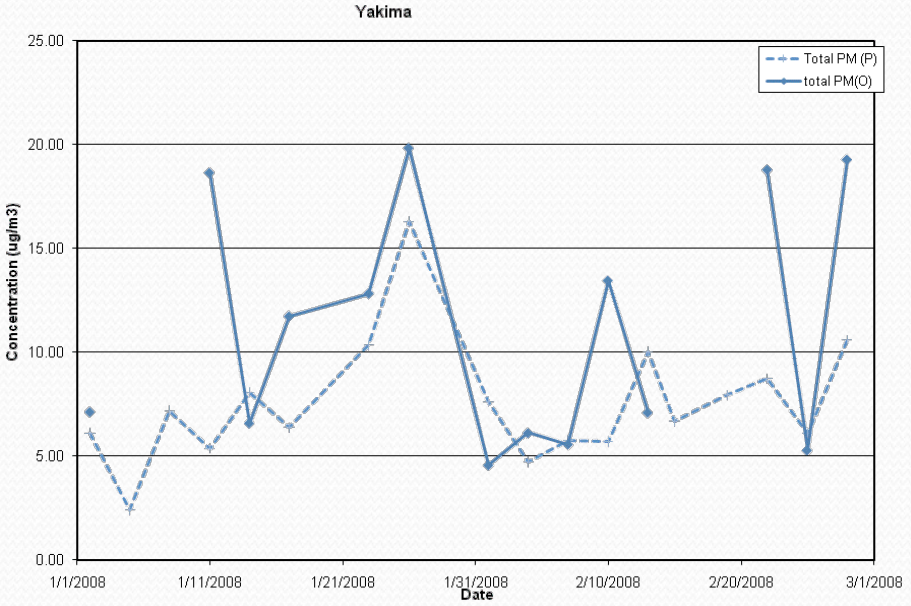




Speciated PM at Yakima



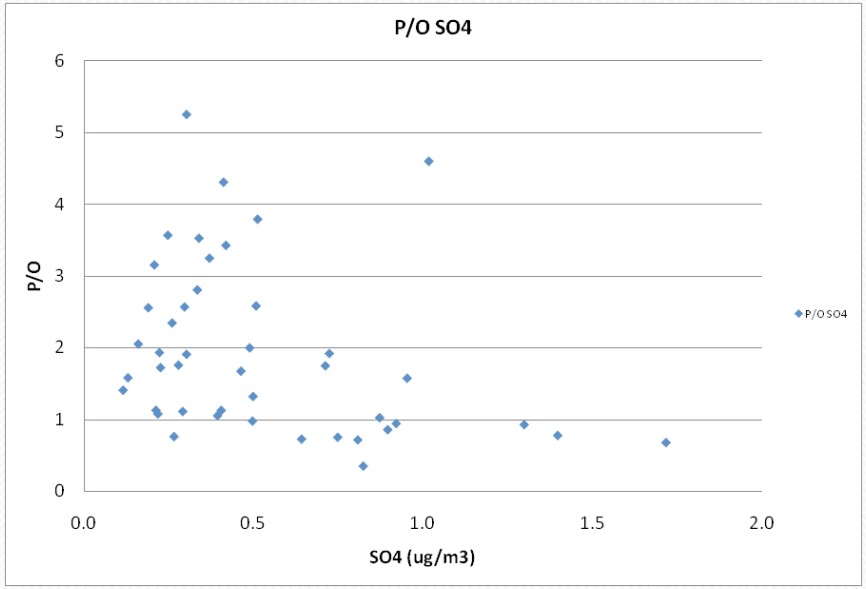


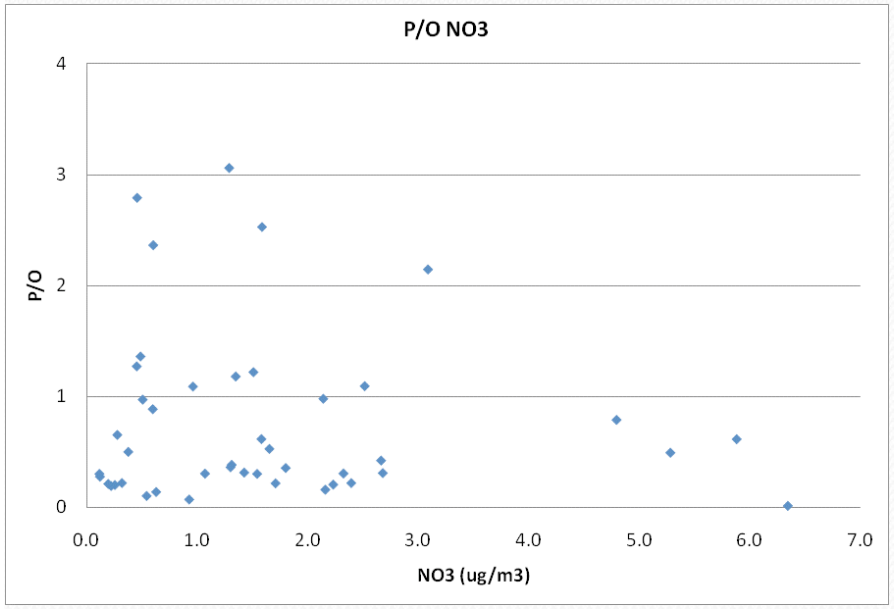


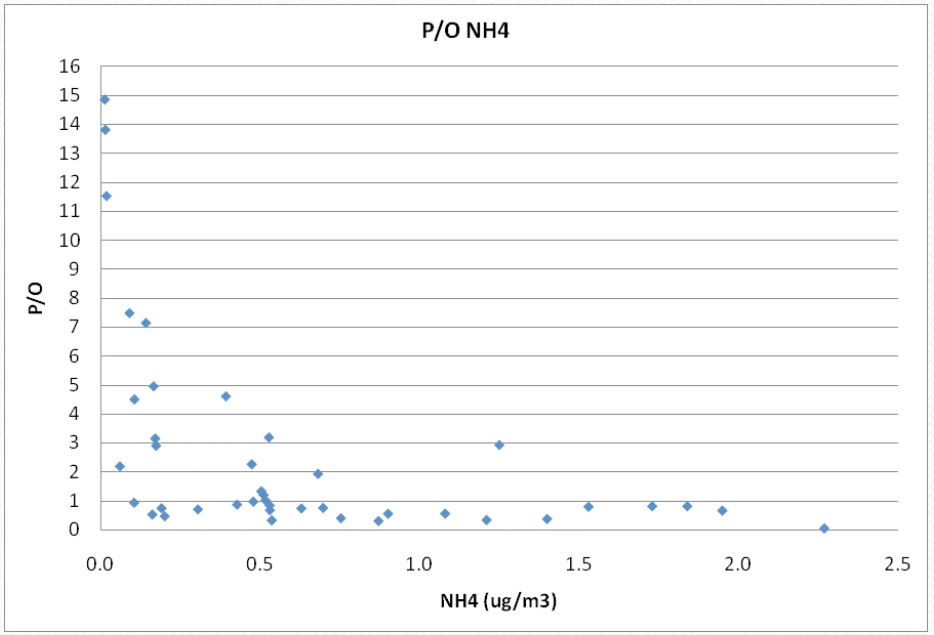
Predicted/Observed vs Observed Speciated PM

Seattle, Spokane, Tacoma, Yakima

Jan, Feb, 2008







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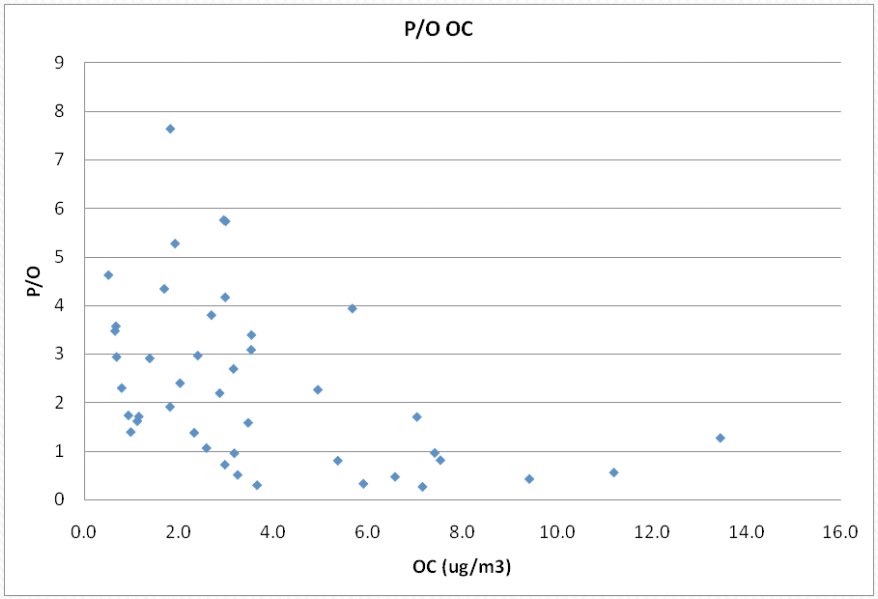
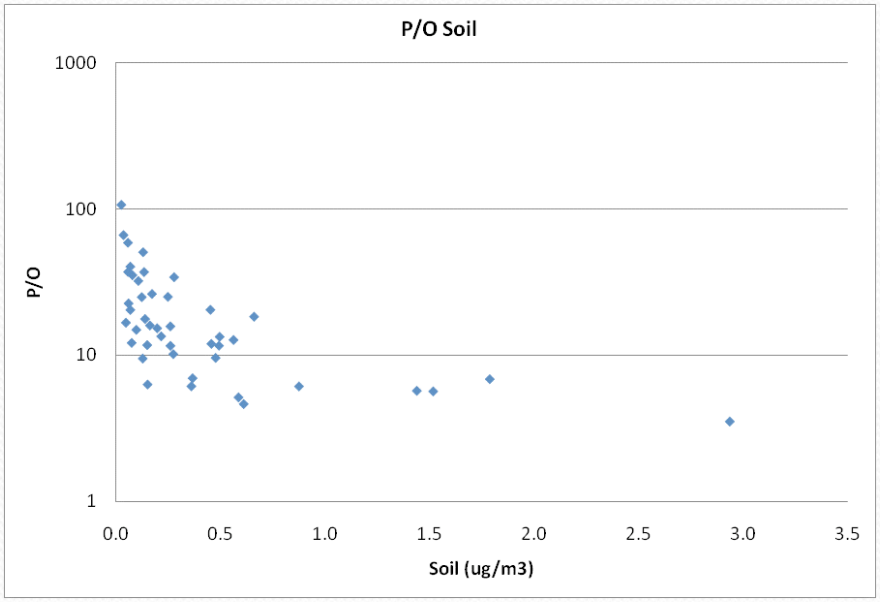
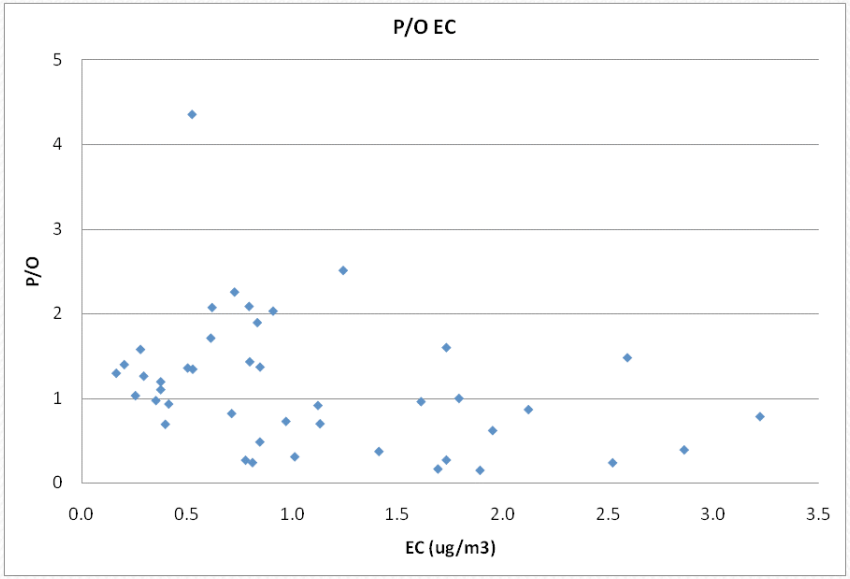
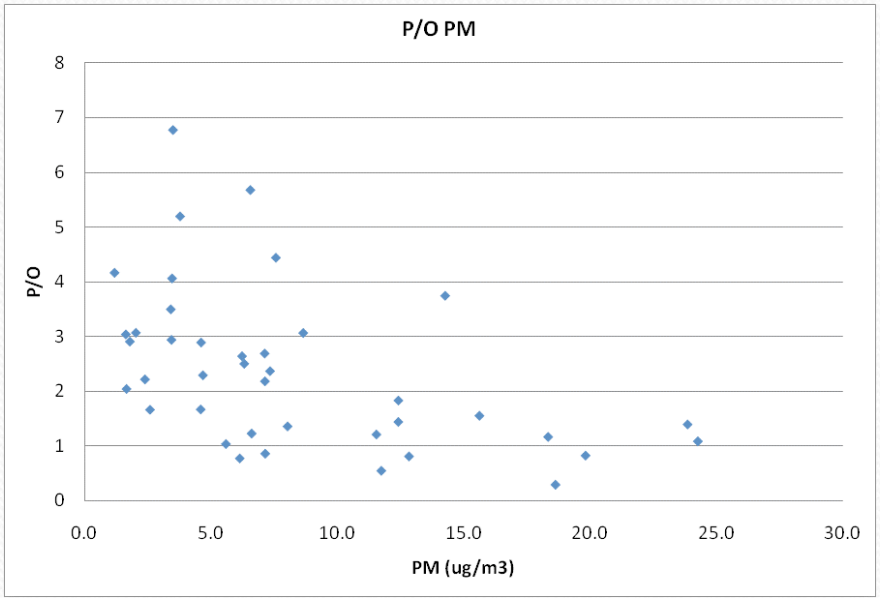




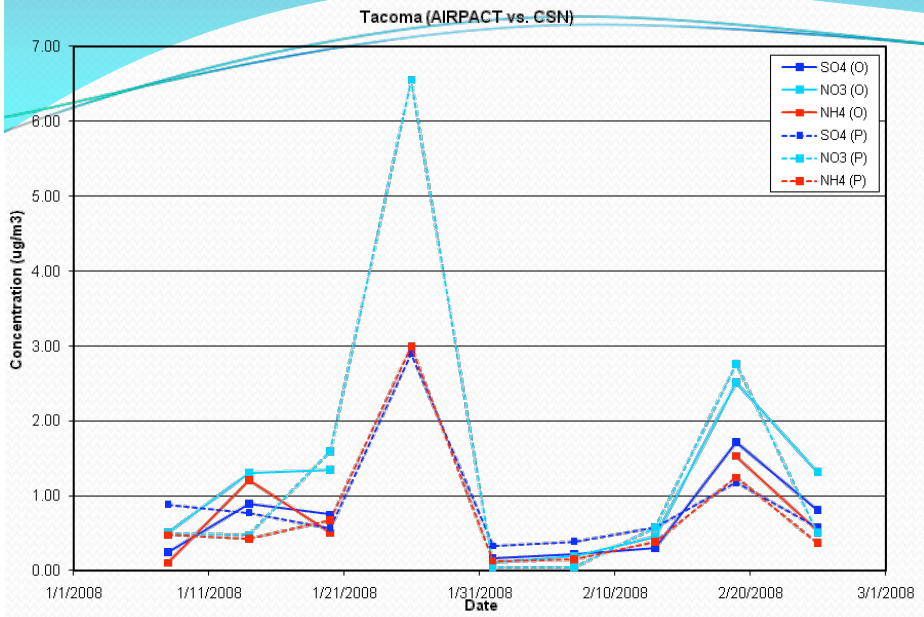


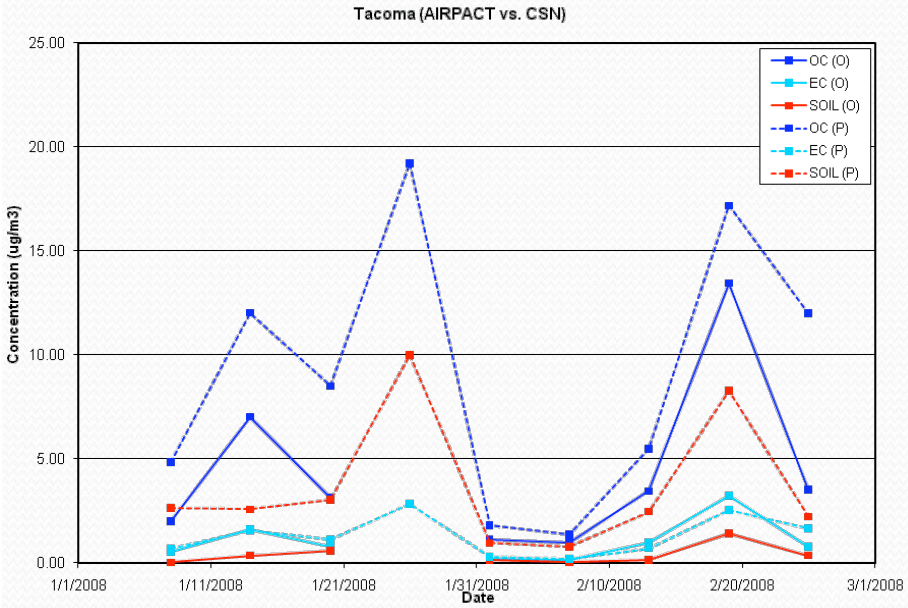


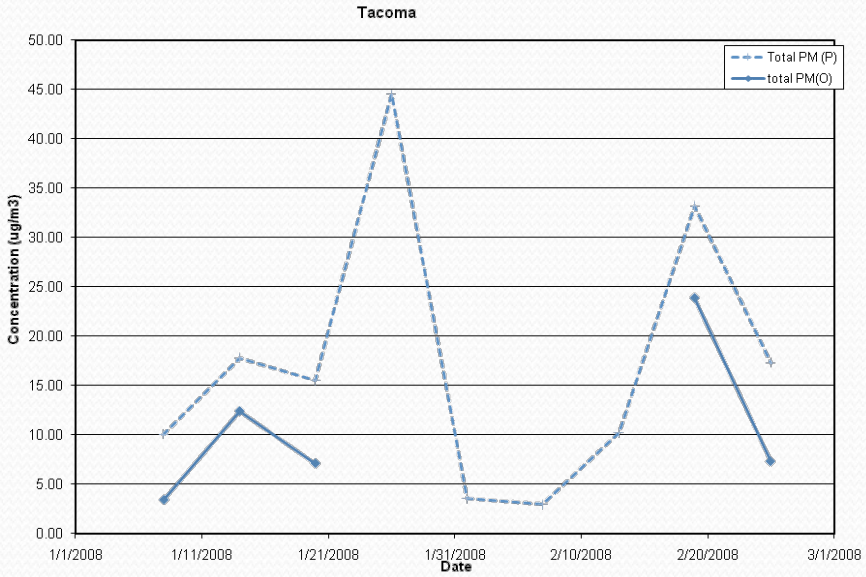
Deposition Mapping

Questions and Discussion

Speciated PM at Tacoma







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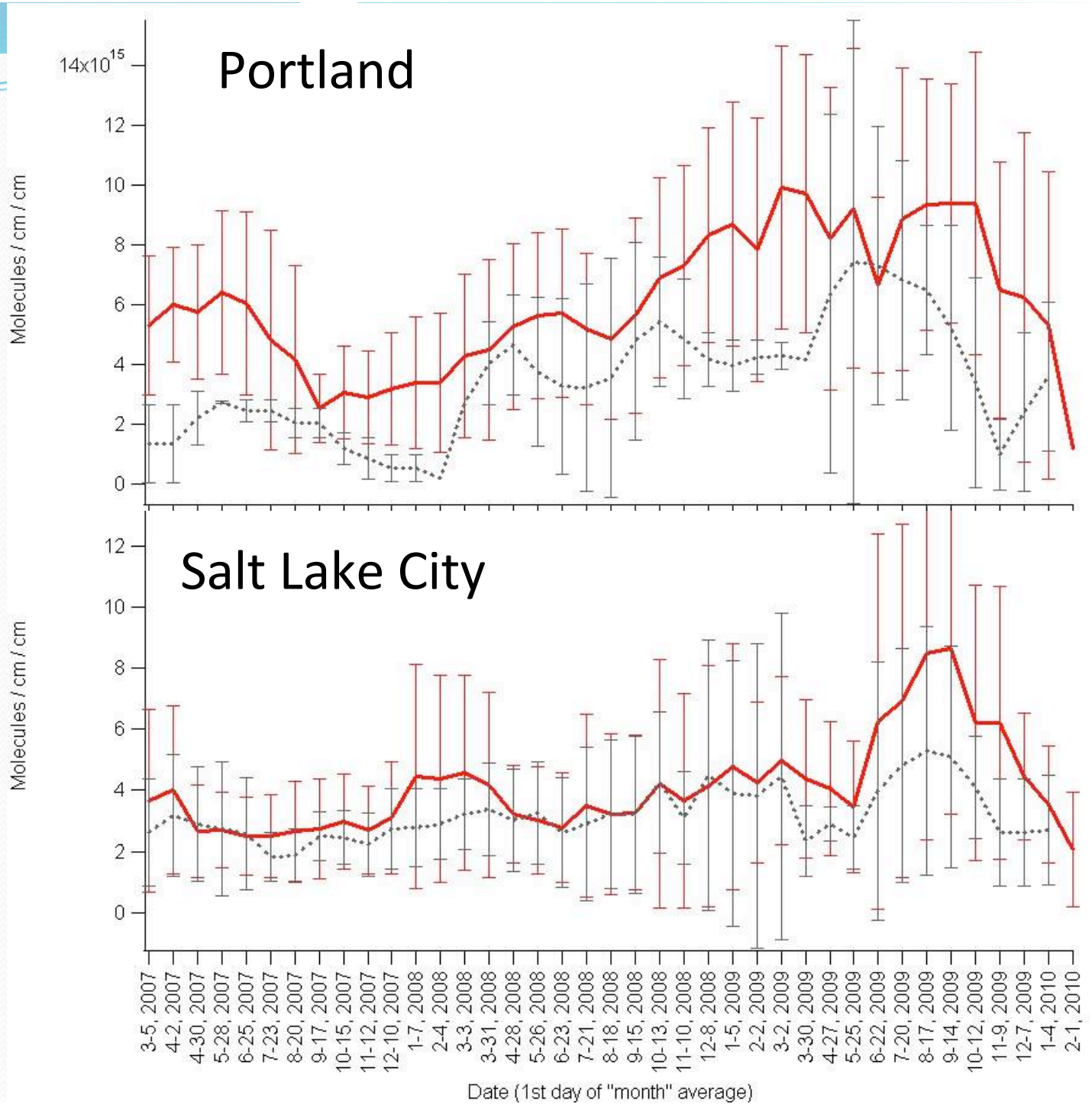

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